

Whispering Pines Bridge
Spanning the East Verde River at Forest Service Control Road
Payson Vicinity
Gila County
Arizona

HAER No. AZ-48

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Western Region
Department of the Interior
San Francisco, California 94107

HISTORIC AMERICAN ENGINEERING RECORD

WHISPERING PINES BRIDGE

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HAER No. AZ-48

Location: Spanning the East Verde River on Forest Service Control Road; 10.5 miles north of Payson; Southwest $\frac{1}{4}$ of Section 34, Township 12 North, Range 10 East Gila County, Arizona; UTM: 12.473970.3803940

USGS Quadrangle: Kehl Ridge, Arizona (7 $\frac{1}{2}$ Minute Series)

Construction Date: Erected in 1913 as part of seven-span bridge; Re-erected as single-span bridge in 1939

Designer: U.S. Office of Indian Affairs, Washington, DC; Midland Bridge Company, Kansas City, MO

Fabricator/Builder: Midland Bridge Company, Kansas City, MO

Present Owner: U.S. Forest Service, Tonto National Forest

Present Use: One-lane roadway bridge (to be replaced in 1995)

Significance: The Whispering Pines Bridge is noteworthy as one of the last remaining spans from the San Carlos Bridge, a large-scale wagon truss built over the Gila River by the Office of Indian Affairs. Completed in 1913, the San Carlos Bridge is technologically significant as the earliest documented example in Arizona of a mainstay structural type: the riveted Pratt through truss. It is historically important as one of the earliest multiple-span wagon bridges erected in Arizona by the federal government. The San Carlos Bridge is also infamous for its failure. Washed out a year after its completion, it stood abandoned for some six years before it was repaired and re-opened. After that, the structure then carried traffic for only 14 years before it was replaced entirely and the individual spans distributed around the state.

Assembled by: Clayton B. Fraser
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Loveland, Colorado

February 1995

The Historic American Engineering Record [HAER] documentation for the Whispering Pines Bridge was conducted by Fraserdesign of Loveland, Colorado, under contract with the U.S. Forest Service, Tonto National Forest. The Forest Service has proposed the replacement of the structure in 1995. This recordation is intended to mitigate, in part, the impact on the bridge by the action. Field recording of the Whispering Pine Bridge was undertaken in February 1995. The research for this project has involved five archival sources: the Arizona Department of Transportation, the Arizona State Library and the Tonto National Forest Office, all located in Phoenix, Arizona; the Gila County Public Library in Payson, Arizona; and the Kansas City Public Library, located in Kansas City, Missouri.¹

From 1848, when much of Arizona territory was acquired from Mexico by the Treaty of Guadalupe, until 1863, with the enactment of the Federal Organic Act that designated the Territory after its separation from New Mexico, Arizona was crossed by only two major overland routes. Both traversed the region from east to west. The northern route followed Army Lieutenant Edward Beale's 1857 survey along the 35th parallel. Known as Beale's Road, it was used almost entirely by hunters and trappers and the military traveling to California.

The southern route was constructed by the famed Mormon Brigade during the war with Mexico in 1856. Extending from Santa Fe to San Diego, this hurriedly built road entered Arizona territory in the southeast corner, extended north to the Gila River and then west to the Yuma Crossing of the Colorado River. Called the Gila Trail because it largely paralleled the Gila River, the road was later made popular by those rushing to California in search of gold. Other secondary routes—no more than trails, really—developed through the region by intermittent use by military convoys and freighters. Road maintenance, such as it was, was generally performed on these routes by travelers as the need occurred. Bridges were virtually nonexistent.

After its formation in 1863, the Arizona Territorial Assembly recognized the need for transportation routes to connect the widely scattered settlements. Money for road construction was scarce, however. The First Territorial Assembly did what government bodies have traditionally done when short of funds themselves: it licensed others to build the roads and bridges for profit. Privately held toll companies were granted exclusive rights to build and administer toll roads and collect fees based upon predetermined price rates. The law did little to encourage excellence in road construction, and toll road operators avoided bridge building as an unnecessary expense. The bridges that were built rarely lasted beyond the statutory limits of the franchises. Poorly con-

structed and unevenly maintained, these rudimentary timber or masonry spans typically washed out in floods or collapsed under load.

The toll roads were generally regarded as a necessary evil, a costly but temporary way to develop a much-needed road system. But the First Territorial Assembly was also aware of the need for free highways to promote transportation and settlement. The lawmakers tried to strike a balance between roads built by private capital and supported by tolls and those over which no tolls could be extracted. To prevent toll operators from monopolizing travel by incorporating every road, the Assembly designated several existing roads—developed solely by prior use—as free routes. This formed the basis for a free-highway network in Arizona, upon which subsequent legislatures would expand by incorporating toll road companies and simultaneously declaring other roads as toll-free.²

Arizona's territory-level management soon proved burdensome, however. To remedy this, the Assembly began transferring responsibility for building roads to the individual counties in 1866 by authorizing the counties to establish road districts to build roads and bridges. In 1871 the Assembly conveyed even more autonomy to the counties by giving them the right to incorporate toll road proprietors themselves. With this, the county administrators possessed the legislative tools needed to pursue active road and bridge programs. They rarely used them well. Seldom following a premeditated plan, county supervisors authorized the surveying and clearing of roads and construction of bridges as needed, usually in response to urgent local petitions. In the sparsely populated areas outside of the major towns, relatively few vehicular bridges were erected before the turn of the century. None is known to remain.

Many of the earliest county-built bridges, like those on the toll roads, tended to be more flimsy than substantial. Often made up of timber stringer spans on timber piles or crude concrete abutments and piers, these structures failed with distressing regularity. Only a handful proved more permanent. Over many washes and creeks, the counties erected kingpost or queenpost pony trusses, with timber compression members and wrought iron tension rods. At longer crossings, the counties erected pin-connected trusses.

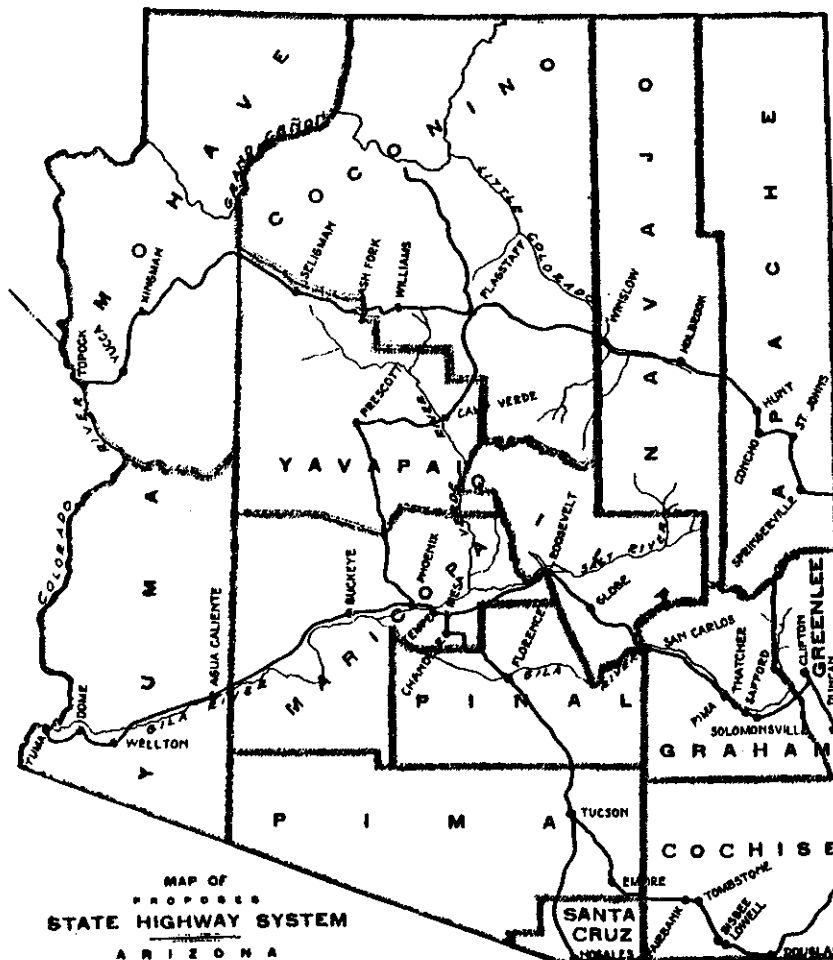
In 1885 Pinal County built one of the earliest all-metal wagon trusses in Arizona. Spanning the Gila River at Florence, the structure consisted of two 180-foot Pratt spans, with an extensive timber trestle over an island and slough.³ Navajo County later built a Pratt through truss to carry the Winslow-Holbrook Highway over Chevelon Creek and other trusses over Clear Creek and the Little Colorado River.⁴ Similarly, Graham County built a four-span Pratt truss over the Gila River at Duncan to replace an earlier wooden structure.⁵ Virtually all of the early metal trusses built by the counties featured relatively modest dimensions, standard Pratt or Parker configurations and pre-fabricated, pin-connected detailing.

After the turn of the century, it had become apparent that many major road projects were beyond the capacity of the individual counties. Furthermore, the counties were building roads on an individual basis, without regard to the roads in adjacent counties. This tended to create an uneven patchwork of dissimilar routes, making travel difficult for all but a few destinations. To take a more active role in the development of intrastate highways, the Territorial Assembly in 1909 created the office of the Territorial Engineer. J.B. Girand, Arizona's first (and only) Territorial Engineer, soon thereafter began construction of several territorial highways. The strategy was to link the county seats and more populous towns through

a network of graded, but unpaved roads, which varied in width from 16 feet to 24 feet, according to traffic and terrain.⁶

By the time Arizona was admitted to the Union in 1912, the territorial government had constructed some 243 miles of highway at an average cost of \$2,500 per mile. Additionally, 1,812 lineal feet of bridges over 100 feet in length had been built, totalling \$144,000 in value.⁷ Girand estimated that an additional 740 miles of trails and county roads would soon be upgraded to form highways, "completing the great east and west and north and south roads."⁸

The north-south highway extended from Douglas, in the state's southeast corner, north through Tucson, Phoenix and Flagstaff, terminating at the south rim of the Grand Canyon [See Figure 1]. The east-west road paralleled the Gila River east from Yuma, as had the Gila Trail, following the river's north side and branching north to



■ Figure 1. Map of Arizona, by Arizona State Engineer's Office, 1914

Phoenix and Mesa. East from Mesa the road followed the Apache Trail to Roosevelt Dam and wound through the mountains to Globe, looping southward past San Carlos, Solomonville and Clifton to Duncan, at the state's eastern border.

"The routes selected had become fixed to a certain extent by the construction of several units of their length," stated Lamar Cobb, Arizona's first State Engineer, "and, though not meeting with entire approval, they had also become fixed in the public mind as the State Highways. It was, therefore thought best not to make any changes in their location as it would undoubtedly lead to others by succeeding administrations, resulting in State Highways 'that would start nowhere and end nowhere,' thus defeating one object of the State Road appropriation—a State system of roads comprised of coordinating county units connecting every county seat in the State."⁹

In connection with this highway construction, Girand supervised construction of a handful of bridges over key river crossings on the territorial network. The first major territorial structure replaced the trusses over the Gila River at Florence. In November 1909 Girand designed a multiple-span girder structure for the new Florence Bridge, which was completed a year later by convict laborers. Girand designed and built other bridges over the Salt River at Tempe, the Verde River at Camp Verde, and the Black River near Fort Apache. "These first bridges," he commented, "are links in the chain that joins Arizona's cities and towns."¹⁰

The territory and counties accounted for what few bridges were being built in Arizona at the time, but a third entity—or group of entities, actually—was soon involved with bridge construction as well. The federal government, through its various agencies, built several vehicular spans as part of government highway programs. Coming from a variety of bureaucratic sources and circumstances, these bridges displayed a wide range of technological expression, some of which were as esoteric as they were dramatic. The bridges themselves were remarkable enough. What was perhaps more remarkable was the fact that they were built at all. Virtually every major bridge built by the federal government in Arizona required individual Congressional approval.

The federal agency most active in territorial and early state road and bridge construction was the Office of Indian Affairs [OIA, predecessor to today's Bureau of Indian Affairs] in the Department of the Interior. With thousands of square miles of land on 19 separate reservations, the OIA was responsible for the infrastructure of a large part of Arizona. OIA's first major structure spanned the Little Colorado River at the western edge of the Navajo Indian Reservation.

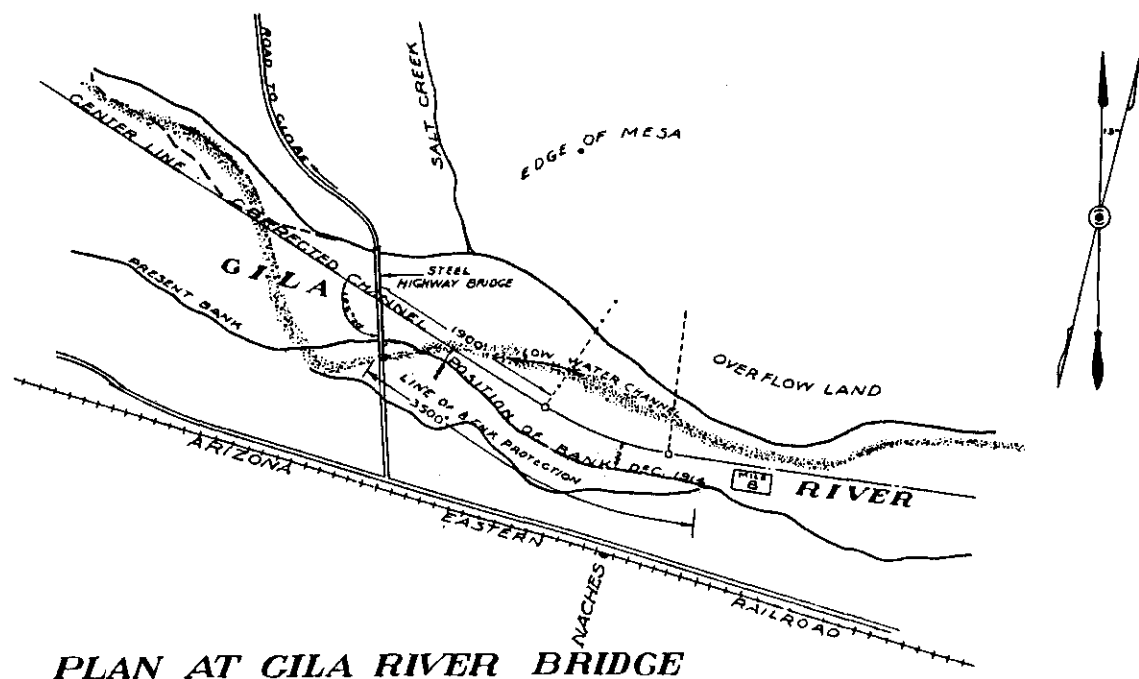
Located about 50 miles north of Flagstaff, the long-span wagon bridge would link the sprawling Navajo and Hopi reservations with Flagstaff. OIA contracted with the Midland Bridge Company of Kansas City, Missouri, in 1910 to design and build the structure. Completed the next year, the Cameron Bridge featured a 660-foot suspension span with steel wire cables and a pin-connected stiffening truss.¹¹

The Cameron Bridge had a profound impact on the commerce and transportation of a rugged, remote and isolated section of Arizona. It soon spawned a trading post and small settlement on its south side and facilitated travel to and from the Navajo Reservation. Perhaps more important commercially, it carried virtually all Anglo freight traffic between Flagstaff and Arizona's northern border.

Inducing the federal government to pay for the territory's internal improvements in the name of Indian advancement had been the idea of Ralph H. Cameron, Arizona's Territorial Delegate to Congress.¹² As his namesake bridge over the Little Colorado was under construction in April 1911, Cameron introduced legislation in Congress to build two other wagon bridges on the San Carlos Indian Reservation.¹³ His bill allotted \$100,000 to pay for steel or concrete structures over the San Carlos and Gila rivers near the town of San Carlos, in southeastern Arizona. Ostensibly, the spans would benefit the Apache Indians by providing all-weather access from the reservation to the Solomonville-San Carlos Highway, the principal route through the region. But they would also form a strategic crossing of the Gila River for Anglo travelers along the territorial east-west route. The San Carlos Bridge, as planned, would combine with the Tempe Bridge under construction over the Salt River and the proposed Antelope Hill Bridge over the Gila in western Arizona to span the route's three most problematic crossings. Moreover, it would form the only point between Florence and Duncan at which Anglo freight wagons could traverse the Gila River on their way to the booming mining district around Globe.

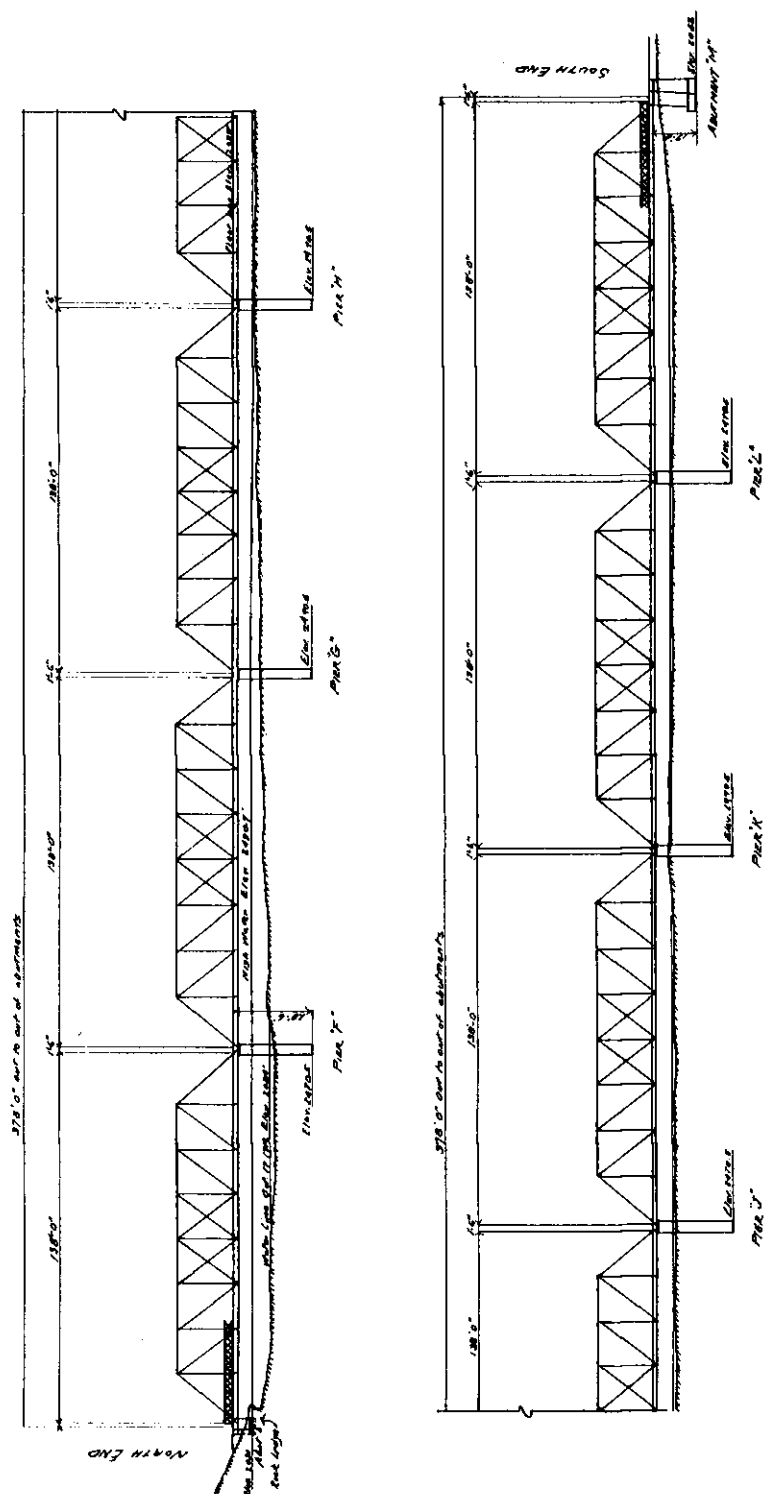
Cameron's bill failed, and he re-introduced it on January 29, 1912, without the appropriation. This too failed. When Arizona was admitted into the United States two weeks later, Cameron was replaced in Congress by Charles Hayden. Hayden almost immediately resumed his predecessor's quest for bridges. On March 30, 1912, he introduced a bill again directing the Secretary of the Interior to examine suitable sites for the San Carlos bridges, as well as a steel span over the Colorado River at the Yuma Indian Reservation.¹⁴ This time, without the commitment to fund actual construction, the legislation passed. The proposed San Carlos and Yuma bridges were surveyed late in 1912; the next year Congress approved funds for their construction.

Responsibility for locating and designing the Gila River Bridge had been delegated to the Indian Office in Washington, D.C. Rather than place the structure at San Carlos, as had been envisioned in the initial legislation, the agency proposed a location more than twenty miles upriver, at the Naches Siding of the Arizona & Eastern Railroad, near Calva. OIA engineers sited the bridge over a meandering stretch of river bounded on both sides by earthen banks [see *Figure 2*]. The Solomonville-San Carlos Highway paralleled the river on its south side, as did the tracks of the Arizona & Eastern Railroad.¹⁵ As delineated by OIA in July 1913, the bridge was comprised of seven Pratt through truss spans, each extending 138 feet in eight equal-length panels, for an overall structure length of 980 feet [see *Figure 3*]. The trusses were supported about twelve feet above the river by concrete mass abutments and concrete-filled steel cylinder piers [see *Figures 4, 5 and 6*]. The trusses had an overall width of 18'4", a nominal roadway width of 16 feet, and an overhead clearance of almost 15 feet beneath the portal struts. Their timber deck and steel stringers were designed to carry a live load of 100 pounds per square foot.



PLAN AT GILA RIVER BRIDGE

■ Figure 2. Site plan of the San Carlos Bridge, adapted from drawing by Frank H. Olmsted, January 1917.



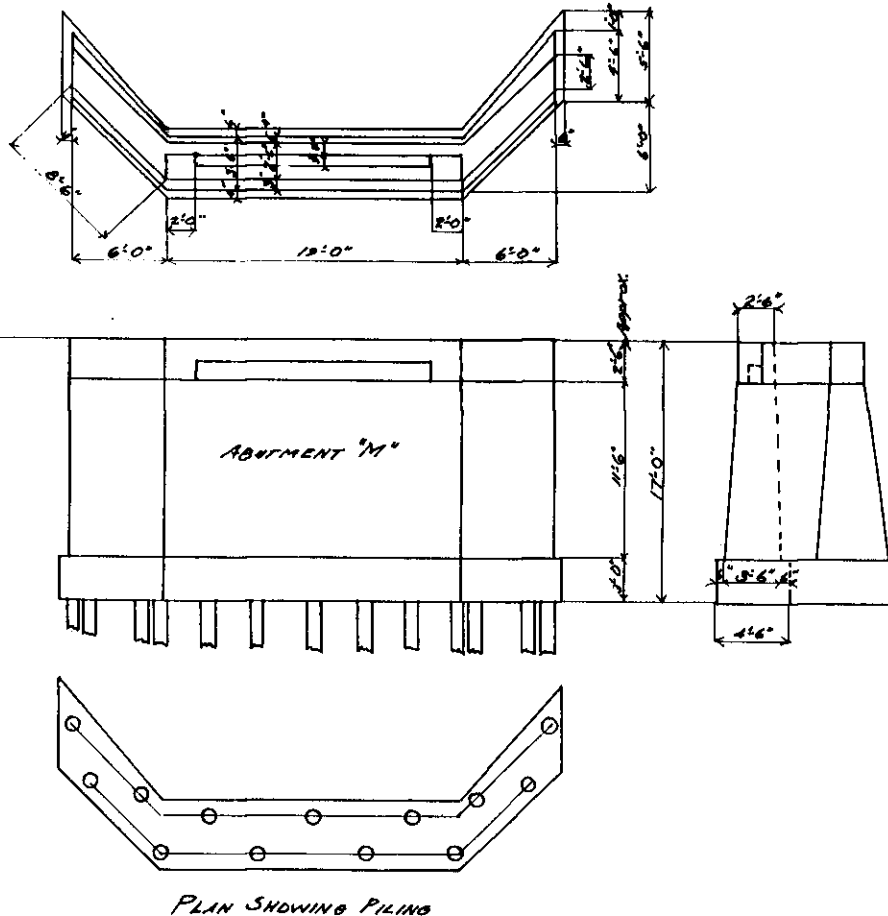
■ Figure 3. Overall profile of bridge, from Department of the Interior, Office of Indian Affairs, General Design of Bridge, July 1913.

To fabricate and erect the San Carlos Bridge, OIA contracted with the Midland Bridge Company, the contractor for the Cameron Bridge.¹⁶ It is unclear whether OIA engineered the trusses for the San Carlos Bridge or whether Midland was responsible for their design. Based on the generalized drawings produced by OIA, the agency probably delineated the overall layout and configuration of the bridge and left the specific truss design and detailing to the bridge company.

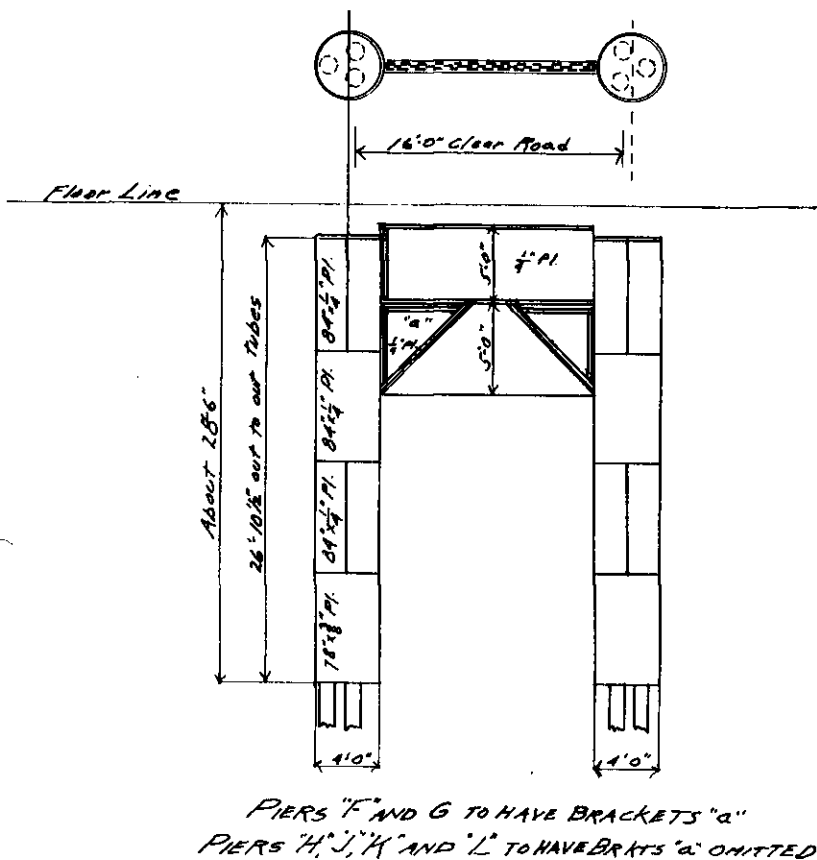
As built, the superstructure consisted of seven rigid-connected Pratt trusses. A mainstay for wagon and railroad trusses, the Pratt truss was patented in 1844

by Thomas and Caleb Pratt. The truss was characterized by upper chords and vertical members acting in compression and lower chords and diagonals that acted in tension. The Pratt's parallel chords and equal panel lengths resulted in standardized sizes for the verticals, diagonals and chord members, making fabrication and assembly relatively easy. In the highly competitive bridge market, in which efficiency equated with profit, Pratt trusses received almost universal use. "The Pratt truss is the type most commonly used in America for spans under two hundred and fifty feet in length," noted bridge engineer J.A.L. Waddell wrote in 1916. "Its advantages are simplicity, economy of metal, and suitability for connecting to the floor and lateral systems."¹⁷

The trusses of the San Carlos Bridge employed field-riveted connections—a technology that was then superseding earlier pinned connections for American bridge construction. The inclined end posts and upper chords consisted of two back-to-back C9x15 steel channels.



■ Figure 4. Detail of south abutment, by Office of Indian Affairs, July 1913.



■ Figure 5. Detail of typical pier, by Office of Indian Affairs, July 1913.

covered by a continuous quarter-inch plate on top and joined by 2½-inch lacing straps underneath. The verticals were similarly configured, with two C6x10.5 channels laced together by 1½-inch steel straps. The lower chords were made up of paired 5x3½x¼ angles with 1½-inch steel strap lacing; the diagonals employed either two 3½x2½x¼ laced angles or four 2½x2x¼ laced angles.

The struts were comprised of two pairs of angles, laced together. The portal struts were comprised of steel angle lattices with curved knee braces. Both upper and lower lateral braces were angles. Eighteen-inch-deep I-beam floor beams were field-bolted to gusset plates at the lower chord panel points. These supported eight lines of 8-inch I-beam or channel stringers, upon which the timber deck was attached. The truss was supported on all four corners by cast bearing shoes, which were anchor-bolted to the piers and abutments.¹⁸

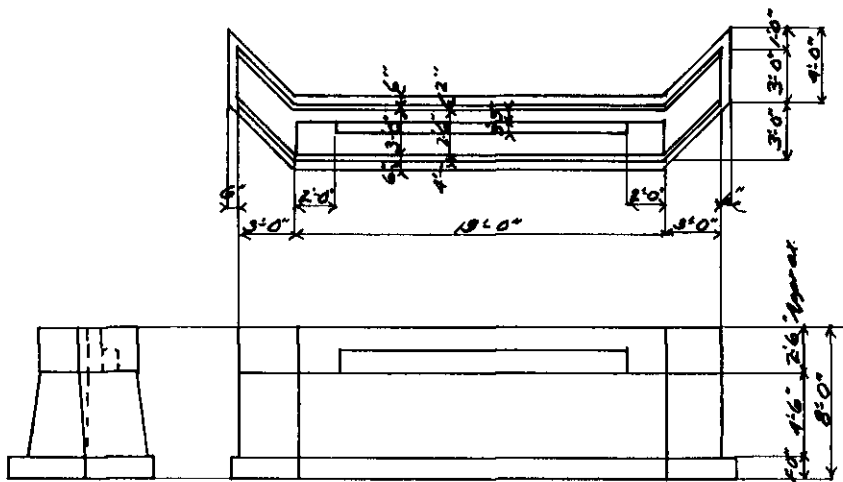
Midland riveted the members of the San Carlos Bridge in its Kansas City shops, using steel pieces rolled in the Pittsburgh mills of the Cambria Iron Works. During the fall of 1913, the firm shipped several carloads of steel to the site by rail and

stored the steel components beside the construction site. Steelworkers then used a wooden traveler to erect the trusses over traditional timber falseworks. The San Carlos Bridge was reported complete by the end of the year.¹⁹

Building the San Carlos Bridge proved far easier than keeping it open to traffic, however. As OIA soon discovered, the Gila River—once called the muddiest river in the world—had few rivals in the West for its sheer destructiveness. Various known as the Rio del Nombre de Jesus (river in the name of Jesus), Rio de los Santos Apostoles (river of the sainted Apostles), Rio de las Balsas (river of the rafts), Rio

del Coral (red river), Brazo de Miraflores and Gila River (from the Spanish "a steady going to or from a place"), this storied watercourse had its headwaters in the mountains of western New Mexico.²⁰

The Gila entered Arizona from the east at Duncan and disgorged itself from its mountainous canyon before meandering through Greenlee and Graham counties.²¹ It flowed beneath the San Carlos and Florence bridges and snaked its way westward through Pinal, Maricopa and Yuma counties, where it emptied into the Colorado River immediately upriver from the town of Yuma.



ABUTMENT "E"

■ Figure 6. Detail of north abutment, by Office of Indian Affairs, July 1913.

The Gila River was notorious for its radical shifts in character. It could range from barely perceptible trickle to violent flood and back within a day's time. The river's relatively shallow descent, wide flood plain and sandy bed permitted fording during low-water stage throughout much of Arizona. But during floods, all traffic across the Gila virtually stopped.

The river flooded to some extent almost every year. Monumental floods, cresting far higher than usual, were logged in 1862, 1869, 1884,

1891 and 1905. "The oldest inhabitant [of Solomonville] is silenced," the *Arizona Republican* stated in the wake of flooding in March 1891. "He fails to name a time when the Gila river was so high as it has been this week." The newspaper reported:

At an early hour on Tuesday morning, about 3 o'clock, people living in the eastern portion of Solomonville were driven from their homes by water coming into them. The Montezuma canal, which was in their rear, had overflowed and that part of the town was soon submerged.

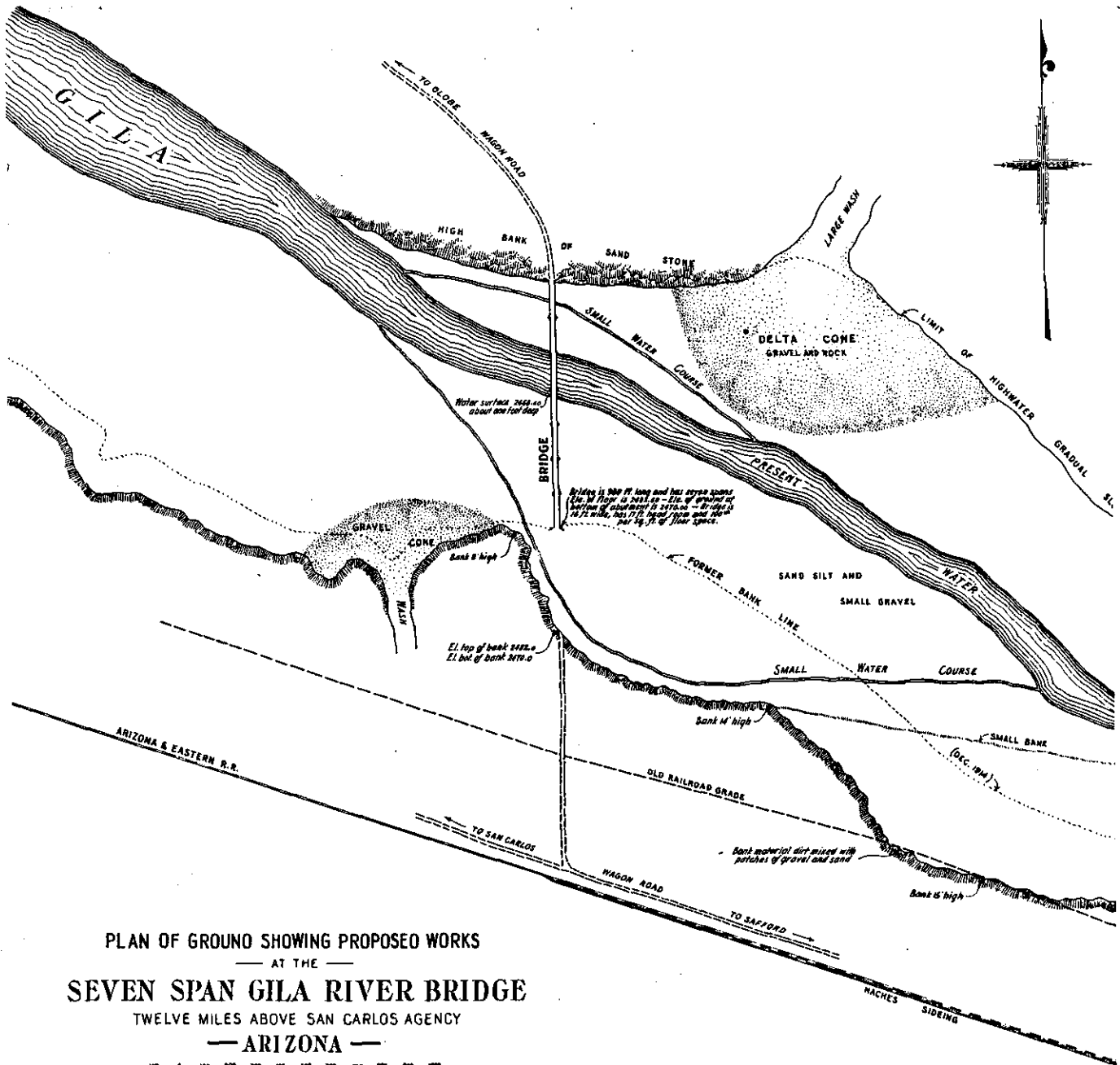
The river was on a level with the alfalfa fields which lay immediately under the Montezuma canal and was at least one and a half miles wide, and its roar was almost deafening... The dams have all been swept away, fences gone; many houses also, and ditches filled with mud. Many fields are badly washed or covered with sand and mud, which will prevent seed already planted from growing.²²

Parts of the wagon bridge at Florence—both the county and the state versions—were carried away with almost every flood. This prompted Arizona Senator Marcus Smith in 1916 to call the hapless structure "a monument to the treachery of the river."²³ During the downpour just before Christmas 1914, the river actually washed away approaches on both sides of the concrete structure, isolating it in the middle of the roaring channel.²⁴

The Christmas flood of 1914 marked the first major test of the San Carlos Bridge since its completion. The steel structure itself withstood the high waters, but the river shifted its channel dramatically immediately upstream, cutting a 500-foot-wide swath through the south embankment [see *Figure 7*]. "The bridge proper was uninjured but left isolated by lack of facilities to confine the stream," State Bridge Engineer Merrill Butler later reported, "permitting the Gila to change its course and wash around the approach."²⁵ With the south approach destroyed, the bridge was rendered worthless, only a year after its completion.

Owned and maintained by the state, the Florence Bridge was soon repaired (and repaired again the following year when another flood destroyed about 1200 feet of embankment at the south end). The San Carlos Bridge, on the other hand, was federal property. Money had been appropriated for the bridge's construction but not its maintenance and not for rectification works on the Gila. A little more than a year after the flood, Frank Olmsted, a Los Angeles-based engineer under contract with the Department of the Interior, investigated the site and recommended that the riverbank be rebuilt to restore the bridge's south approach.²⁶ But without funds, the Indian Office could do nothing to repair the structure. It thus stood abandoned, as the river cut progressively deeper into the south embankment at each flood. "The usefulness of this particular bridge has been lost to the community for a period of something over five years because of erratic stream action," Butler wrote in 1920. "Necessity for stream control is, therefore, emphasized in conjunction with bridge construction and maintenance."²⁷

Instead of re-channeling the river under the bridge, the Indian Office eventually opted to extend the bridge over the new channel. OIA reportedly added four 126-foot trusses to the structure's south end to reach the new embankment.²⁸ The San Carlos Bridge was thus put back into service in February 1921. In the mid-1920s, it was made part of U.S. Highway 180 (later U.S. 70) and placed under the aegis of the state highway department. As traffic along the highway increased, the narrow trusses eventually formed a bottleneck. By the mid-1930s the highway department was planning a new, wider structure to replace the San Carlos Bridge.



■ Figure 7. Overall plan showing damage to San Carlos Bridge, by Frank H. Olmsted, September 1916.

In 1935 a new bridge was built at Bylas, immediately upriver from the existing structure. The next year three of the spans from the original San Carlos Bridge were moved and re-erected at two locations on the Prescott National Forest in Yavapai County. To build the new bridges and provide employment during the Depression, laborers were enlisted from the "vast army of unemployed transients" housed in Transient Camps across the state.²⁹

A fourth span was eventually moved onto the Tonto National Forest north of Payson. After receiving a right-of-way easement for a bridge across the East Verde River at the Whispering Pines development in July 1939, the Forest Service built new concrete abutments and moved one of the 138-foot trusses to the Whispering Pines site.³⁰ The Whispering Pines Bridge has since functioned in place at this remote forest crossing. Its original steel lattice guardrails have been replaced with Armco beams, and the original timber deck has been replaced with asphalt over steel bridge plate, but the truss superstructure itself remains in unaltered and relatively well-preserved condition. The Whispering Pines Bridge is presently scheduled for replacement in 1995.

Chronically short of funds, the county, territory and state governments of Arizona have historically enlisted the help of the federal government to extend the impact of their road and bridge programs. Beginning with the first military trails and continuing to the present—in which sumptuous grants are made to the state annually by the Federal Highway Administration—the government has played a major role in building Arizona's infrastructure. The Indian Office was one of the earliest of the federal agencies active in the territory in the early 1910s. Under the direction of Arizona's Congressional delegation, OIA funded, in whole or in part, such large-scale structures as the Cameron Bridge, the Yuma Bridge, the Topock Bridge, the Navajo Bridge and the San Carlos Bridge. These strategically placed spans were nominally built to promote the socioeconomic development of nearby reservations. But they have proved more significant as conduits for regional and interstate traffic.

The various federal and local agencies responsible for this traffic have undertaken bridge construction with decidedly mixed results. Early engineers avoided building bridges when they could, and when they could not, they often eschewed permanency for low construction costs. As a result, structures that functioned perfectly well over languid desert streams were ripped apart when the streams turned to flood.³¹ The Florence and the Antelope Hill bridges over the Gila River, the Coldwater Bridge over the Agua Fria River, the Tempe Bridge over the Salt River and numerous lesser spans all required perennial maintenance to keep them

serviceable. Even among these notorious structures, the San Carlos Bridge was a particularly egregious example of bridge failure. Completed in 1913, it was closed in the wake of its first major flood a year later. With no funds to repair it, the bridge was allowed to languish unused for some six years before it was re-opened. The addition of four more trusses in 1921 was not so much a restoration of the bridge as an acknowledgement that the Gila River was beyond the engineers' control.

The history of bridge construction in Arizona is studded with noteworthy technological successes. It is also marred by disastrous failures. The San Carlos Bridge—and its descendant, the Whispering Pines Bridge—illustrates elements of both.

Endnotes

¹This HAER documentation draws upon the Arizona statewide inventory of highway bridges for background information. For more on bridge construction in Arizona, see Clayton B. Fraser, "Arizona Bridge Inventory," prepared for the Arizona Department of Transportation, October 1987.

²Arizona State Highway Department, "History of the Arizona State Highway Department," unpublished manuscript, 1939, located at the Arizona State Library, Phoenix, Arizona, pp. 2-3.

³*Arizona* [Florence] *Blode-Tribune*, 24 July 1916, 1 August 1915.

⁴Arizona Good Roads Association, *Road Maps and Tour Book* (Prescott, Arizona: Arizona Good Roads Association, 1913); reprint edition, Phoenix: Arizona Highways, 1987.

⁵Proceedings of the Graham County Board of Supervisors, Book 6, p. 216 (16 August 1909), located at the Graham County Courthouse, Safford, Arizona.

⁶"History of the Arizona State Highway Department," p. 4.

⁷*Report of the State Engineer of the State of Arizona: July 1, 1909, to June 30, 1914* (Phoenix: Arizona State Press, 1914), p. 5.

⁸"History of the Arizona Highway Department," p. 5.

⁹*Report of the State Engineer of the State of Arizona*, p. 5.

¹⁰*Ibid.*

¹¹For more on the Cameron Bridge, see Don Abbe, Roger Brevoort and Doug Kupel, "Cameron Suspension Bridge: National Register of Historic Places Registration Form," June 1980, on file at the Arizona State Historic Preservation Office, Phoenix, Arizona.

¹²Directing funds that had been appropriated for Indian support to serve Anglo needs was hardly novel. The Office of Indian Affairs had been prey to pork barrel politics almost since its inception in 1824. Despite occasional efforts by reformers to clean it up, the Indian Office remained the archetype of government corruption and inefficiency throughout the 19th and early 20th centuries. Although bridge construction did indeed benefit Indians, it undoubtedly profited the commerce and transportation of Anglos far more. Howard R. Lamar, ed., *The Reader's Encyclopedia of the American West* (New York: Harper and Row, 1977), p. 550. Several exhaustive studies of the Indian Office have been produced, including Robert M. Utley, *The Indian Frontier of the American West: 1846-1890* (Albuquerque: University of New Mexico Press, 1984); Francis Paul Prucha, *The Great Father: The United States Government and the American Indians* (Lincoln, Nebraska: University of Nebraska Press, 1984); and Paul Stuart, *The Indian Office: Growth and Development of an American Institution, 1865-1900* (Ann Arbor, Michigan: UMI Press, 1978).

¹³H.R. 1682, 62nd Congress, 1st Session, (1911). The text of Cameron's bill reads as follows:

A BILL to authorize the Secretary of the Interior to construct bridges across the San Carlos and Gila Rivers on the White Mountain or San Carlos Indian Reservation, in the Territory of Arizona, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and is hereby, authorized and directed to construct suitable steel and concrete wagon bridges, with approaches thereto, across the Gila and San Carlos Rivers on the White Mountain or San Carlos Indian Reservation, in the Territory of Arizona, for the use and accommodation of the Indians and the general traveling public on the said Indian reservation.

That the Secretary of the Interior is hereby authorized to select the most practical available sites for said bridges at points on said rivers, not to exceed three miles above the confluence of said rivers.

That the Secretary of the Interior is hereby authorized to make all necessary regulations to carry out this Act, and for the purpose of carrying its provisions into effect there is hereby appropriated, out of any money in the United States Treasury not otherwise appropriated, the sum of one hundred thousand dollars.

¹H.R. 22720, 62nd Congress, 2nd Session, (1912). The text of Hayden's bill reads as follows:

A BILL to authorize the Secretary of the Interior to investigate the necessity for constructing bridges on the White Mountain, or San Carlos, Indian Reservation, in the State of Arizona, and on the Yuma Indian Reservation, in the State of California, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and he is hereby, authorized and directed to make an investigation of the conditions on the White Mountain, or San Carlos, Indian Reservation, in the State of Arizona, with respect to the necessity of constructing suitable steel and concrete wagon bridges, with approaches thereto, across the San Carlos Creek and the Gila River, in the vicinity of San Carlos, on said reservation, and also to cause surveys, plans, and reports to be made, together with an estimated limit of the cost for the construction of said bridges, at such sites as he may select, and submit his report thereon to Congress on the first Monday in December, nineteen hundred and twelve; and the sum of two thousand dollars, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the purposes herein authorized.

That the Secretary of the Interior be, and he is hereby, authorized and directed to make an investigation of the conditions on the Yuma Indian Reservation, in the State of California, with respect to the necessity of constructing a suitable thoroughfare bridge of sufficient strength and capacity to safely carry street cars, in addition to foot and wagon traffic, over and across the Colorado River, connecting Fort Yuma, on the Yuma Indian Reservation, Imperial County, State of California, with the town of Yuma, State of Arizona, and also to cause surveys, plans, and reports to be made, together with an estimated limit of the cost for the construction of said bridge, at such site as he may select, and submit his report thereon to Congress on the first Monday in December, nineteen hundred and twelve; and the sum of one thousand dollars, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the purpose herein authorized.

¹⁵The highway between San Carlos and Solomonville underwent substantial improvements between 1912 and 1914, perhaps in anticipation of the San Carlos Bridge. In 1912 Graham County transferred \$2,000.00 to the Indian agent at the San Carlos Reservation to grade the route between San Carlos and Geronimo, along which the bridge was located. An additional 16-mile stretch east of Geronimo was undertaken in 1913-14. The construction involved extensive roadwork and construction of nine wooden bridges with an aggregate length of 258 feet. *Report of the State Engineer...*, pp.69-70, 84-85, 109-110.

¹⁶A frequent contractor for the OIA, the Midland Bridge Company was, for most of its existence, structured as a partnership of two Kansas City civil engineers—Henry Freygang and A.A. Trocon. According to Kansas City directories, the firm was first formed around 1900 and continued operations until sometime between 1928 and 1930. In July 1920 Midland reorganized as a corporation based in Augusta, Maine. Corporate officers were then listed as:

E.M. Leavitt, President
Albert Trocon, Vice President
Ray Cargill, Secretary
L.E. Haskell, Treasurer
Earnest McLean, Clerk

The absence of Freygang's name suggests that he had by that time left the company, either through retirement or death. Midland built several steel structures in Arizona (e.g., the Cameron Bridge, the San Carlos Bridge, the Allentown Bridge and the Hereford Bridge), as well as in Nebraska, Iowa, Wyoming, Colorado and Utah.

¹⁷J.A.L. Waddell, *Bridge Engineering* (London: John Wiley and Sons, 1916), page 468.

¹⁸The description is based upon an inspection of the Whispering Pines Bridge by Clayton Fraser, 8 February 1995.

¹⁹Arizona State Highway Department, *Fourth Biennial Report of the State Engineer to the Governor of Arizona: 1918-1920* (Phoenix: Republican Print Shop, 1921), p. 65.

²⁰Byrd Howell Granger, *X Marks the Ploce: Historical Names and Places in Arizona* (Tucson, Arizona: Falconer Publishing Company, 1983), pp. 259-60; Ross Calvin, *River of the Sun: Stories of the Storied Gila* (Albuquerque: University of New Mexico Press, 1946), p. 1-5.

²¹"The Gila River... rises in the cool and forested areas stretching along the western slope of the American continental divide in New Mexico and Arizona. From the elevated mountain sides and plateaus where the stream has its origin it flows some 250 miles in its meandering to reach the lower line of Graham County, dropping 6,600 feet in this distance of an average fall of 26.7 feet per mile of river channel. The stream has a drainage area above San Carlos of 12,020 square miles. The stream has only a few valley openings of agricultural land above San Carlos. These are Safford Valley, 35,000 acres; Duncan Valley, 6,395 acres; San Francisco, Blue and Eagle Creeks, 820 acres; and a possible 4,000 acres more in New Mexico, making about 46,000 acres in all... The watershed is now distinguished by the frequency and intensity of its flash floods, which sweep down from the upper mountains loaded with silt and coarser detrital matter from the caving banks of its channel feeders in the San Francisco, Mogollan and Tularosa Ranges." Frank H. Olmsted, *Report on Gila River Flood Control in Graham County, Arizona, and Hydrography on the Mountain Watershed of That Stream in Arizona and New Mexico* (Washington, D.C.: U.S. Department of the Interior, 1917), page 38.

²²"Reviewing the Storm," *Arizona Republican*, 4 March 1891.

²³"Erosion and Overflow, Gila River, Ariz.," 16 March 1916, in U.S. Senate, 64th Congress, 1st Session, Calendar No. 239, Report No. 262, p. 4.

²⁴"Gila Pours Around Both Bridge Ends," *Arizona Republican*, 24 December 1914. The newspaper reported with tongue in cheek about the first wooden structure at Florence, illustrating the precarious nature of bridging the Gila:

The flanking at both ends of the new state bridge at Florence by the angry Gila reminds old-timers that once there was a wooden bridge there that promised to become the longest structure of the kind in the world. That championship would have been achieved if they had not run out of lumber. When the bridge was constructed, it was made long enough to fit the river. But when a flood came and cut around one end of the bridge and gave evidence of a permanency of channel, another span was built to accommodate it. Thus flood after flood made a new span necessary at one end or the other until the bridge had stretched across a considerable part of Pinal county.

It looked for a time as if the counties of Pima and Maricopa would be called upon to help support this thriving and growing bridge. But before it extended beyond the boundaries of Pinal, other floods came and washed out the new spans at either end and finally took all the structure away except the middle span, which stood there for years, a monument to the failure of man to bridge the universe.

²⁵*Fourth Biennial Report of the State Engineer*, p. 65.

²⁶Frank H. Olmsted, *Report on Gila River Flood Control...*, p. 35.

²⁷*Ibid.*

²⁸*Ibid.*

²⁹Claude W. McKenzie, "Wanderers Go to Work," *Arizona Highways*, June 1936, pp. 10, 22.

³⁰"Easement: A.T. Vaughn and wife, to United States, 12 July 1939, Road # 1264.2; 66' R, with Reversionary Clause," noted in Tonto Land Status Book, located at Tonto National Forest Headquarters, Phoenix, Arizona. The re-erection date for the Whispering Pines Bridge cannot be definitively stated, but the 1939 date can be inferred with some confidence from: U.S.D.A., Forest Service, "Statistics, Southwestern Region, Arizona and New Mexico," 1 March 1939, 1 March 1940, 1 March 1941, 1 March 1942 and 1 March 1943.

³¹"The fault [for bridge failures] cannot be laid at the door of the engineer, although he is not infallible," explained Arizona Highway Department Bridge Engineer Ralph Hoffman. "He can only go as far as the funds provided will permit. The State spends millions to build surfaced roads making them passable in all kinds of weather and leaves an unprotected gap here and there for the reason that the engineer is trying to make his money cover as much mileage as possible." Ralph A. Hoffman, "Lack of Finances Held Responsible for Washing Away of Bridges in Flood Times," *Arizona Highways*, January 1927, pp. 10-11.

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